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THE NEWSPAPER FOR
THE HOBBYIST OF VINTAGE
ELECTRONICS AND SOUND

THE HORN SPEAKER

MORE PAGES
EVERY QUARTER

To give more needed space in The Horn Speaker, especially after going to the smaller format, the March, June, September and December editions will be planned for 12 pages. During the period of a year the newspaper will have more space.

NEW TELEPHONE TRANSMITTER.

We give an engraving of a new transmitting telephone, patented by Mr. E. Berliner, of Boston, Mass., and owned and made by the American Bell Telephone Company, of that city. Fig. 1 is a front view and Fig. 2 a perspective view showing internal parts.

The instrument is very simple and compact, and has the all important advantage of not being liable to disarrangement.

The principal feature of the invention is the disposition of the carbon contact surfaces, one being attached to the diaphragm, the other being supported by a metal socket attached to a hinged plate secured to an arm that projects from the back of the mouthpiece downward over the diaphragm. This arm serves the double purpose of supporting the free carbon electrode and clamping the diaphragm in its place against the back of the iron mouthpiece. The diaphragm is bound around the edges with soft rubber, and is separated from the mouthpiece by a ring of pasteboard. The iron mouthpiece is hinged to a casting fastened to the circular box which contains the induction coil and supports the binding screws for the battery, line, and ground wires. To the front of the induction coil is attached a plate connected with the battery wire, and carrying a spring having in its free end a screw which bears against a spring connected with the center of the diaphragm and acts as a dampener as well as a conductor, through which the current passes to the carbon electrode at the center of the diaphragm. The battery current enters at one of the binding screws, passes through the primary wire of the induction coil, through the spring and carbon electrode at the center of the diaphragm, through the hinged electrode, metallic mouthpiece and its hinge, and back through a binding screw to the battery.

The variation of the current in the primary circuit occurs at the contact of the two carbon electrodes, the contact being varied by the vibration of the electrode attached to the diaphragm.

When the transmitter is used for long distance telephony, the pendent carbon electrode is made heavier, to reduce resistance in the local current and to amplify the electrical undulations.

The terminals of the secondary wire of the induction coil are connected with the two remaining binding screws, which are connected, one with the ground and the other with the line, in the usual way.

The accessory devices connected with this transmitter may be of the usual character. It will operate well with any of the well known forms of receiver, and is easily managed and thoroughly efficient. This transmitter has been well introduced, and large numbers of them are being used in Europe. They have been adopted on several of the leading German railways, and are extensively used in the German postal service.

Fig.1

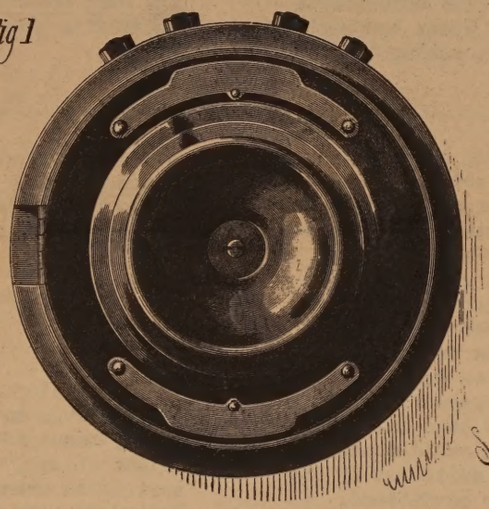
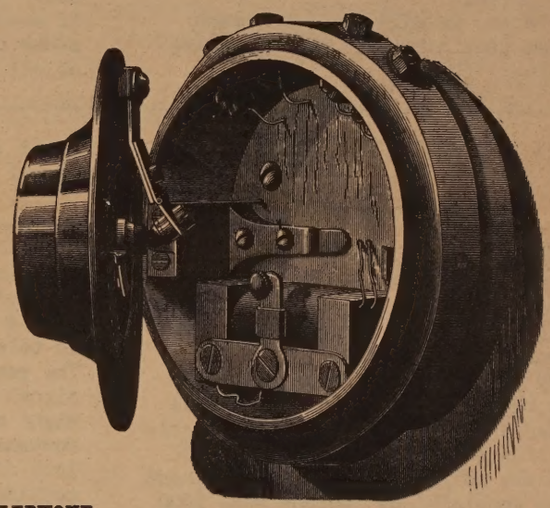


Fig.2



BERLINER'S TRANSMITTING TELEPHONE.

SCIENTIFIC AMERICAN, May 21, 1881

TRF TUNED RADIO FREQUENCY

NEUTRODYNE, A GOOD WAY

Considerable interest has been expressed about tuned radio frequency radio, especially the neutrodyne which stabilizes the circuits and at the same time utilizing all of the available electrical gain.

Since a triode detector gives a response porportional to the square of the voltage applied to its grid, a twofold gain in voltage across coil E by tuning it will result in a fourfold increase in signal. More gain may be secured by placing a variable condenser (capacitor) across the secondary of the R.F. transformer E. This makes it possible to tune the circuit E C to the frequency of the impulses in coil D and much higher voltages are induced.

Before manufacturers ganged all the variable condensers together, provided all the circuits had the same electrical characteristics, two stage radio amplifiers had three controls, which is familiar to the old battery set collector. However, the straight tuned radio frequency stage would tend to oscillate.

Some of the methods wasted energy in order to prevent oscillation. Since a vacuum-tube oscillates because electrical impluses are exchanged or thrown back and forth between the grid and plate circuits which requires some sort of coupling which may be magnetic or between a plate coil and a grid coil or electrostatic, as in a condenser. The grid and plate of a triode form a tiny condenser (interelectrode capacitance) which acts as a coupler between the two parts of the system. This coupl-

ing is so small that it is not effective until the parts are tuned when very little coupling is needed to cause oscillations.

That explains why small neutralizing condensers are placed between the grids of the R.F. stages (C4 C5) in the diagram (Schematic). You will see in the diagram that the plate coil D is not tuned directly, but the magnetic reaction of current in E upon D gives the same effect as placing the variable condenser across D.

When a small condenser of proper capacity is connected between E and G an electrical impulse is impressed upon the grid (G) equal in amount and opposite in sign to the impulse given to it by the condenser G-P. This action destroys the coupling and makes the circuit very stable.

Shielding of various parts of the old sets helped the neutralizing condensers to make oscillation impossible by preventing magnetic and electrostatic coupling between the parts.

Later, we will see how screen tubes took over the job of neutralizing

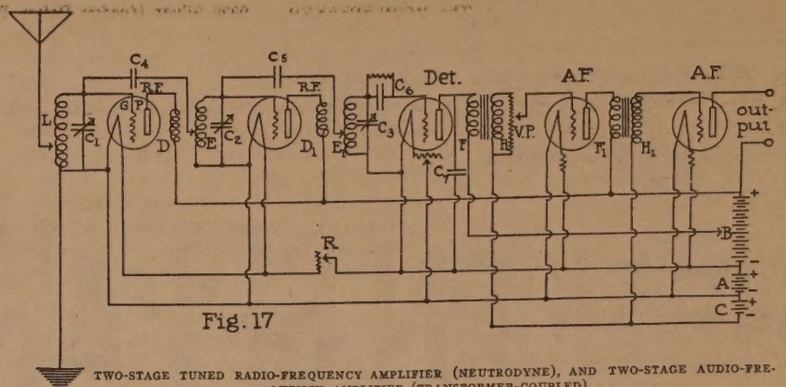


Fig. 17

TWO-STAGE TUNED RADIO-FREQUENCY AMPLIFIER (NEUTRODYNE), AND TWO-STAGE AUDIO-FREQUENCY AMPLIFIER (TRANSFORMER-COUPLED)

C_1 C_2, C_3, tuning condensers; C_4, C_5, neutralizing condensers; C_6, grid condenser and grid leak; R.F., radio-frequency tubes; Det., detector; A.F., audio-frequency tubes; D-E, D_1-E_1, tuned transformers; F-H, F_1-H_1, audio transformers; R, rheostat; C_7, by-pass condenser; V.P., volume-control potentiometer.

The neutrodyne circuit was developed by Professor L. A. Hazeltine.

ALIGNING TRFs

Put a signal generator on the antenna and an output meter on the speaker. Start in the middle of the dial and adjust the first stage for maximum gain, then the second stage, etc. Then repeat the adjustments, if needed, on the lower and higher sides of the dial, making the best of all locations.

If the receiver is of later construction and is provided with both trimmer condensers and slotted end plates for alignment, read the procedure in the September '75 issue of The Horn Speaker or read page 691 of Gherardi's Modern Radio Servicing, 1935.

LETTERS

EDITOR'S MAILBAG

Dear Jim:

I have enjoyed reading The Horn Speaker and look forward to receiving each copy as the articles are particularly interesting.

My collection of tubes and lamps has been growing slowly and I have added a 1881 Edison lamp to the collection recently. It cost me $80. but was well worth it. Other recent lamp acquisitions include seme 1000 watt 1920 vintage bulbs and coloured glass bulbs I have waited 15 years for. The only valves of interest have been some British and European ones of the mid '20s.

Sincerely,
Fin Stewart
Ferrowatt Electrical Museum
673 Great Western Highway,
Faulconbridge, N.S.W. 2776
Australia

To the Editor:

I own several Scott receivers and have an antenna problem. Because of limited space, I have erected a "L" antenna on my house. The problem arises as to lead-in, and input impedance of Scott receivers. I am trying to feed my early Philharmonic with 75 Ω coax with the hot wire to the antenna and shield free. At the receiver, one ant. post is connected to gnd. and coax shield; the hot wire goes to the other ant. terminal. This results in low noise, as from TV, but poor signal transfer. I have tried 300 Ω TV twin lead, but while signal improves, noise goes up drasticly. This happens no matter what combination of antenna connections I have tried at the receiver end.

I experimented with a twisted pair of wires recently. I used only a 50 foot section of twisted telephone cable and no antenna. The results were as hoped for; no signal. It is apparent that this might make a good lead in. Unfortunately, this cable doesn't look as if it is suitable; If one considers outdoor conditions. I am considering, therefore, twisting some good quality wire and making my own 1935 vintage lead-in wire. Can anyone confirm the usefulness of this type of lead-in?

Also, my research indicates that the old RCA double-doublet, with matching transformers was quite a good antenna. It seems to have been copied by everyone in those days. Does anyone know if it is available in any form and where?

I hope someone can suggest a less lossy, yet well shielded lead-in than coax. Any takers?

Mike Stosich
414 Assembly Dr.
Bolingbrook, Ill. 60439

Dear Sir:

The data you published on the input characteristics of old tubes has been most helpful to me. I also find the output characteristics to be helpful, especially in designing power supplies (battery eliminators) for old sets. I recently found the enclosed output characteristics in Proceedings of the Institute of Radio Engineers vol. 14, 1926. You may be interested in publishing them also.

Sincerely,
Jack R. Smith

Dear Jim:

I am enclosing a copy of a brochure that I found in an old radio I recently acquired. It came out a little "light struck," as the original was sort of an orange color & would not reproduce very well. But the old radio I have is just exactly like the picture & is in real good condition. The front panel with its sterling silver plated escutcheons & hardware really cleaned up nicely and took on a high polish. It is one of the most beautiful old battery sets I have ever seen. But, other than this brochure, I can not find any reference to such a radio or the company that made it. Perhaps, if you find this of sufficient interest to mention it sometime in your publication, someone may know something about the set or the manufactor.

I have a feeling that it may have been assembled by the Allied people from parts furnished by "Erla" as that name (ERLA) is stamped in the back of all three variable condensers, on the grid leak & on 3 or 4 bypass condensers so it certainly looks as if there may be a connection.

Lionel Haid
26 Circle Drive
Richmond Ind. 47374

EDITOR: The brochure Mr. Haid included with the letter would not reproduce but it named Ramway, "The Most Sensational Value in the World."

Club News

KEN LONGENECKER, SECRETARY
OHIO CLUB

From Soundings, the official publication of The Buckeye Antique Radio and Phonograph Collector's Club, there is news that Ken Longenecker, 1937 Stoney Hill Drive, Hudson, Ohio 44236 has accepted the job of club secretary for 1975.

ANTIQUE WIRELESS MUSEUM,
NEW YORK

The Antique Wireless Association has opened a museum free of charge to the public from May through October on Sundays from 2 to 5 p.m. and Wednesdays from 7 to 9 p.m. It will be opened to radio clubs, schools and engineering groups at other times by advanced appointment.

"The exhibits will try to tell the story of electrical communication starting with Samuel F.B. Morse's 1840 telegraph to present day television and solid-state circuitry," noted Bruce Kelley, association secretary. "In addition to communication items, there will be a large electrical display - early electric motors, light bulbs, measuring instruments and phonographs."

The museum in East Bloomfield, New York is located on South Avenue (off Routes 5 and 20) and across from Elton Park, the village green.

Information and quotes are from Daily Messenger, Canandaiqua, New York, May 2, 1975, contributed by Ernest E. Mintel

SOUTHWEST VINTAGE RADIO AND
PHONOGRAPH SOCIETY

The Society had fun and success at the Olla Podrida exhibit in Dallas. They enjoyed seeing their radios exhibited and were pleased to learn about other collectors unknown to the Society previously.

The Society will be regional and it would like to hear from others who would like to join. Those who would like to join write to the newly-elected secretary, Walt Jackson Southwest Vintage Radio and Phonograph Society, P.O. Box 19406, Dallas Texas 75219. Phone 214 262-7855.

A monthly newsletter is mailed to the members which is edited by Bob Sullivan. It is reported that the newsletter will be designed to interest members who can't attend any of the meetings as well as the ones who go to all the meetings.

John Alford is head of a committee to work out the details of dues, membership forms, etc. By the way, Jim Cranshaw was elected Chairman and Mel Zemek is the Vice-Chairman.

The next meeting has been set to be at the home of Bob Sullivan, 513 Hanover, Irving, Texas at 7 p.m. on June 21, 1975.

Plans are being made to have an exhibit at the Chapman Automobile Museum in Grand Prairie, Texas. For information call Jim, 286-1673.

BIG SWAP MEET MID-AMERICA

"The Mid-America Antique Radio Club is going full gun. In only 6 months we now have around 50 paid members. Last week we had a display at the Electronics World show, then had a table with displays at Indian Springs shopping center for 4 days & then on Sunday a display at PHd Ham fest. About 12 members participated. We're having our big swap-meet July 13 at Loose Park, contest & picnic. Hope to have Fred Stein, Jr. (son of the Steinite manfacturer) there.

Picked up nice Radiola VII, General Radio GR-3, Tresco 3 tube regen., Steinite, Crystal, Grebe CR 8 & 9, National HRO lately," wrote Bob Lane on May 6, 1975. His professional address is 2301 Independence Ave., Kansas City MO 64124, phone (816) 241-6796.

ALEXANDERSON, RADIO PIONEER DIES

Famous not only for the high frequency alternator which produced a continuous wave transmission for successful broadcasts with 2 kilowatts and 100,000 cycles in 1909, an improvement of Fessenden's alternator, Ernst Frederick Werner Alexanderson died May 14, 1975 being hailed by General Electric as their most prolific inventor. His many inventions mentioned frequently in the old radio books and magazines are familiar to radio collectors and historians.

In addition to the admiration from other radio engineers he was given the honors first of the gold medal of the Institute of Radio Engineers, and then of the presidency of that organization in 1921.

At the May meeting of the Southwest Vintage Radio and Phonograph Society, Earl McDonald, a radio engineer showed some slides of the Alexanderson Alternator at Haiku, Hawaii Naval Station, in commemoration of Dr. Alexanderson.

THE OUTPUT CHARACTERISTICS OF AMPLIFIER TUBES

Tube	Plate Voltage E_b	Grid Bias E_c	D.-C. Plate Current (Milliamperes) I_b	Amplification Factor μ	Plate Resistance (Ohms) r_p	Mutual Conductance (Micromhos) g_m	$\frac{\mu^2}{r_p}$ (Micromhos)	Load Resistance R_b	$\frac{\mu}{R_b+r_p}$ Output Current per Volt (Microamperes) A_1	$\frac{\mu R_b}{R_b+r_p}$ Output Voltage per Volt Input A_1	$\frac{\mu^2 R_b}{(R_b+r_p)^2}$ Output Power per Volt Squared Input (Milliwatts) A_1	A-C Grid Voltage (R.M.S.) for $P_{...}$ E_c	Maximum Undistorted Output (Milliwatts) $P_{...}$
UX-199	90	— 4.5	2.5	6.5	15250	425	2770	15250	212	3.25	.690	3.18	7
	90	— 7.5	1.3	6.45	19250	335	2160	32000	126	4.00	.505	5.30	14
UX-201-A	90	— 4.5	2.0	8.5	12000	708	6000	15000	315	4.70	1.480	3.18	14
	90	— 6.0	1.2	8.4	15100	550	4620	30000	185	5.55	1.025	4.24	17
	135	— 9.0	2.55	8.4	11000	764	6410	22000	255	5.60	1.430	6.36	55
UX-120	135	—22.5	7.0	3.3	6600	500	1650	6900	250	1.65	.412	15.90	105
	135	—26.7	5.5	3.2	7500	427	1365	15000	142	2.13	.302	18.90	110
UX-171	90	—16.5	10.0	3.0	2350	1275	3820	4000	472	1.89	.803	11.58	105
	135	—27.0	16.0	2.9	2100	1380	4000	4000	475	1.90	.902	19.10	320
	180	—40.5	20.0	2.9	2000	1450	4200	4000	483	1.93	.934	28.60	710
UX-210	135	— 9.0	5.0	7.5	8000	940	7050	15000	336	4.89	1.59	6.36	64
	250	—18.0	11.5	7.5	5600	1310	10050	11000	451	4.97	2.25	12.72	310
	400	—35.0	16.0	7.5	5400	1390	10400	11000	457	5.03	2.30	24.80	1340
UV-203-A	1000	—22.5	26.0	25.0	8800	2840	71000	17600	947	16.70	15.80	15.90	3920
UV-211	1000	—48.5	75.0	12.0	3400	3540	42400	6800	1177	8.00	9.41	34.30	11000

FIND OF THE MONTH

During the last month no collectors have reported unearthing anything rare under unusual circumstances at "steal" prices. Since THS skips two months during the summer, there should be a lot of "finds" in the September issue.

BACK ISSUES

ORDER NOW!

The Horn Speaker

All 20 back issues for 1973 and 1974.....$10.00

All 10 back issues for 1973 .....$5.00

Any issue from January 1973 to now.....50¢ea.

Later, we should have complete volumes for 1972.

The Horn Speaker

Box 12 Kleberg, Texas 75145

The Classic Radio

"CUSTOM BUILT FOR E.H. SCOTT"

By J.W.F. Puett

Receiving a number of requests for a "professional type communicattions receiver," E. H. Scott, who built radios during the old days that connote the ultimate in electronic achievements and cabinet styles, soon found himself at the proverbial drawing board. This would be one of the last and greatest of his ingenious designs -- perhaps the most elaborate communications receiver the world had ever seen. The circuitry of his Scott Philharmonic radio would be the basis for his design.

In 1941, the Scott Special High-Fidelity Communications receiver was announced in the Scott News. Selling price? -- $650.00 F.O.B. Chicago.

Two tuner circuits were incorporated on the same chassis, one for the seven short wave bands (1.7 to 64 MHz) and the other for the two lower ranges (1710 to 520 KHz and 395 to 140 KHz). Each tuner utilized two rf amplifier stages with a separate mixer and local oscillator. The alignment procedure requires 94 different adjustments. There were three I.F. amplifier stages. In addition to a diode type noise limiter, a Scott scratch suppressor circuit was provided to improve the signal-to-noise ratio on weak signals with respect to high frequency hiss and static.

E. H. Scott spent many happy hours with his own Special. He maintained a listening station in his upstairs den. His antenna system consisted of two Scott super double doublett Antennas, one being positioned from North to South and the other from East to West. Switching was provided to select the desired antenna; however, "about 90% of the time the antenna facing North and South gave the best signal."

With separate tuners for standard broadcast and short wave, Mr. Scott reported in a 1941 issue of the Scott News, "I can have two stations tuned in on the Special at the same time, one on the short waves, another on the broadcast band, and by a flick of the switch marked "Wavechange" and without touching any other control, I can bring in either station instantly." "It is extremely interesting, when one of the local stations is rebroadcasting war news from Europe, to switch over and receive the same program from the European station, then by throwing the control switch, make an instant comparison between recep-direct from Europe and the same program being rebroadcast from the local station.

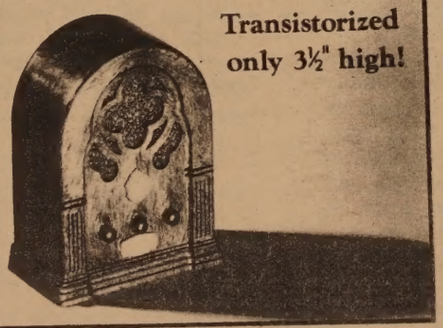
No one seems to know how many Scott Specials were built. The general consensus of opinion is that they were never manufactured in the same way that Scott home-entertainment sets were. Some broadcast stations used this set to monitor foreign newscasts during World War II. It is quite possible that a few Specials are still floating around in the archives of "obsolete" equipment at some of the older broadcast stations.

This receiver consists of a large black crackle-finish metal cabinet which houses the chrome-plated tuner

you'll have fun with this....

Old Time Radio

Transistorized only 3½" high!



OLD TIME TRANSISTOR RADIO

ONLY 9.90 Postpaid

Remember the good old days . . . when everyone sat around the parlor listening to the radio? This is a miniature copy of that famous cathedral-style old-time radio and measures 3½ x 1½". Our model has five transistors and two diodes and comes in handsome woodgrain plastic case. A wonderful piece of nostalgia. Uses one 9-Volt battery which is included. Each comes gift-boxed.

WALTS EMPORIUM

P O. BOX 19406 DALLAS. TEXAS 75219

EVENINGS 214-262-7855

The Microphone—Radio's Electric Ear

Continued from last month.

The condenser microphone, although of ancestry quite as ancient as the loose-contact one, owes its present development chiefly to an engineer of the telephone industry of today, Dr. E. C. Wente of the Bell Telephone Laboratories. Like the carbon microphone, its principle is simple. The thin metal diaphragm merely serves as one plate of an electric condenser. If this plate moves back and forth with reference to the other plate, all other conditions remaining the same, the electric capacity of the condenser changes in accordance with the familiar formula in which the distance between the two plates of the condenser is one item of the equation. Rhythmic alterations of the condenser capacity thus are created by sound, are picked up electrically, amplified and constitute the output of the microphone.

This condenser microphone has been a truly invaluable device, not only in broadcasting and sound recording during the past few years, but in the development of the art of acoustic measurement. Until very recent months microphones of this type have been the only ones constant enough in efficiency and other characteristics to be used at all for precise measurements. With nothing better than carbon microphones, no modern noise meter could have been developed.

By possible, although difficult, precautions concerning mechanical dimensions and the like, condenser microphones may be made to respond to sounds as high in pitch as 10,000 cycles and to have virtually the same response ratio between sound energy and electric energy over the entire frequency range between 40 cycles and 10,000 cycles. This is what is meant by a microphone the response characteristic of which is flat.

Not every condenser microphone, even of responsible manufacturers, has this much-desired flat characteristic, but the best types can be made to have it by perfect design and adjustment, avoiding the peaks or hollows of response at specific frequencies due to mechanical resonances in metal parts or in inclosed air spaces. What is even more important practically, the response characteristic of a condenser microphone, whether flat or not, commonly remains the same over long periods unless the instrument is actually taken apart or damaged.

All condenser microphones suffer, however, from a serious defect which apparently is incurable and which seems to me sufficient to destroy any chance of this type of instrument becoming the perfect microphone of the future. This defect is the necessity of placing the actual microphone diaphragm, the so-called button, within a few inches of the first vacuum tube of the amplification system. Usually this first tube is placed in the case containing the microphone, which makes that case bulkier than is desirable and also requires the supply to it of battery or other voltages for the tube.

This necessity, any radio engineer will perceive immediately, springs from the fact that the thing which this microphone really detects is a minute change of electric capacity. The capacity of the wires leading from the two condenser plates in the microphone to the terminals of the first amplifier tube naturally becomes a part of the total capacity which is being varied by the sound. If these leads are more than a few inches long their invariable capacity becomes too large a part of the whole capacity which operates the instrument and the microphone will not perform satisfactorily. It is hard to see how this limitation of condenser microphones can be escaped any more than carbon microphones can escape the handicap of variation in the behavior of its loose contacts.

These serious defects of both other types provided the opportunity of the newest microphone to be perfected, the so-called dynamic or electrodynamic type. Again the principle is old and familiar; it is merely the interaction between an electric current and a magnetic field, responsible for the electric motor, the telegraph, the galvanometer, the modern dynamic loudspeaker and literally hundreds of other devices. In the kind of dynamic microphone which seems to me the most promising a small coil is attached to a diaphragm which is vibrated by the sound waves so that the coil vibrates in a fixed magnetic field. This is the reverse of a dynamic loudspeaker, the micro-

chassis. The chrome-plated amplifier chassis and the wide-range 12-inch speaker are housed in separate black crackle-finish metal cabinets. A nameplate in the center of the tuner front panel of each Scott Special was inscribed - "CUSTOM BUILT FOR _____" with the name of the customer. Only four Scott Specials are known to exist in collections in the United States. The nameplate on one of these is inscribed "CUSTOM BUILT FOR E. H. SCOTT." This set may very well have belonged to Mr. Scott himself, and it is probably the same one shown in the Scott News and Scott sales brochures of that period.

While most communications receivers are "notoriously deficient in tonal quality, the Scott Special circuitry included a 25-watt R.M.S. high-fidelity audio amplifier. An optional 40-watt amplifier was available. Separate bass and treble controls allowed the operator to vary the tonal response from high-fidelity performance to levels more desirable for communications reception.

phone coil corresponding to the voice coil. Vibration of the diaphragm causes small corresponding currents in this coil.

A reversed variant of this sometimes is called the magnetic microphone. In this type a small magnet or bit of iron is attached to the diaphragm and vibrates in the neighborhood of a coil of wire, thus generating corresponding currents in the coil. This is the reverse of the magnetic loudspeaker. Both types are closely related, it is obvious, to corresponding types of phonograph pick-up.

The great practical advantage of these microphones is that the electric impulse delivered is a small current rather than a minute change of capacity. No battery is required. The leads from the microphone to the amplifier may be of any reasonable length; probably up to several hundred feet. Tests that have been made on modern forms of this dynamic instrument indicate that its constancy and its freedom from disturbance are as great as those of the condenser microphone, if not greater. The only difficulties now left to confront the dynamic microphone seem to be mechanical ones inherent in the diaphragm and its accessories, not electric ones. The energy output, while less than that of the carbon microphone, may be made equal or superior to that of the condenser device.

It is not difficult to write the specifications of an ideal microphone. The trouble is to meet them, for several involve physical impossibilities. One requirement, for example, is that the mechanical parts which vibrate in response to the sound waves should have no inertia. If they have, the response to high frequencies is lessened, since the vibrating mass does not have time to start before the sound wave reverses in direction and the vibration is ready to start back. This means a diaphragm with no mass at all, which probably is impossible.

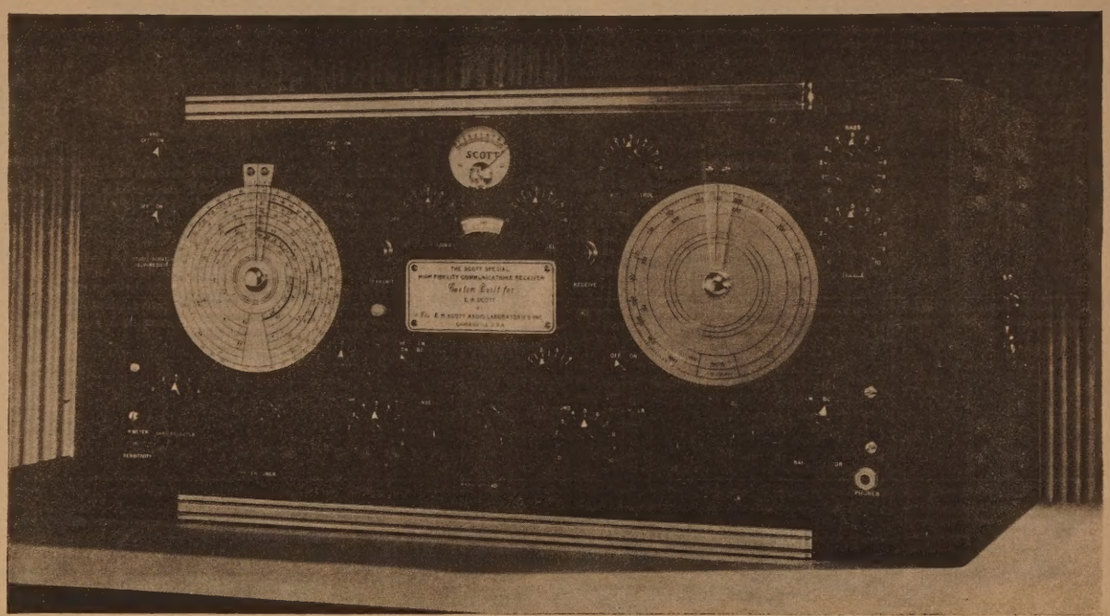
Only two vibrating units now known to science are virtually massless: a stream of electrons like those in a cathode-ray tube and a beam of light. Both have been tried for microphones and perhaps one or both can be perfected, but nothing really successful has been accomplished as yet. Even the dynamic microphone, therefore, seems destined to be handicapped for a few years at least by a diaphragm which has mass. This means that there will continue to be an upper limit of frequency beyond which the microphone will not respond, although this limit certainly is above 10,000 cycles per second and probably can be made higher.

Another characteristic of an ideal microphone would be that neither the mechanical parts of the device such as the diaphragm nor the attached electric circuit have any resonance of its own, to build up the signal at some special frequency or frequency range and produce a peak of response not present in the original sound. This is a present-day fault of almost every type of condenser or dynamic microphone, especially of the cheap ones for which there is so great demand. The remedy is careful design of the purely mechanical features, for it is chiefly the mechanical resonances that are troublesome rather than electric ones.

A third requirement of the ideal microphone is that it should not itself interfere with, or limit, the electric circuits to which it is attached, as present condenser microphones do by requiring short leads to the first tube of the amplifier. This requirement the new dynamic microphones promise to meet satisfactorily.

Finally, the ideal microphone should not itself interfere with the sound wave which it is detecting; another virtual impossibility, since this would necessitate, in physical theory, either that the microphone should occupy no space or should allow the sound waves to pass through it exactly as they would do through empty air. The closest practical possibility is to make the microphone as small as possible, another item in favor of the dynamic type of instrument, since these probably can be made much smaller than now, although probably not so small as a carbon microphone. The Bell Telephone Laboratories recently have developed, however, an exceptionally small condenser microphone, the so-called "fountain pen microphone," which is said to be small enough to make its physical interference with the sound wave almost negligible.

Many other types of microphone are conceivable; some, perhaps, based on principles not hitherto tried, others as revivals and improvements of principles once tested and discarded. One of the latter is the hot-wire microphone, responding to the changes of air temperature created by the passing sound waves. Another is the liquid resistance microphone like one of the first successful ones of Alexander Graham Bell. The effect of sound waves on a high-voltage, glow-discharge maintained between two metal



The Dual Tuning Chassis of the Special High Fidelity Communications Receiver

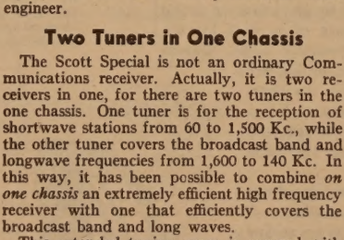
The Scott Communication Receiver

DURING the past twelve months we have received many requests for a professional type Communications receiver, and the Scott Special has been designed to meet these demands. It is a 26 tube receiver incorporating 22 separate controls, and while a genuine Scott in every respect it is not recommended for the average listener as it has been designed principally for the use of the professional radio engineer.

Two Tuners in One Chassis

The Scott Special is not an ordinary Communications receiver. Actually, it is two receivers in one, for there are two tuners in the one chassis. One tuner is for the reception of shortwave stations from 60 to 1,500 Kc., while the other tuner covers the broadcast band and longwave frequencies from 1,600 to 140 Kc. In this way, it has been possible to combine *on one chassis* an extremely efficient high frequency receiver with one that efficiently covers the broadcast band and long waves.

This extended tuning range is covered with nine wave bands, seven for the ultra high and shortwave frequencies, and two bands for the long wave and broadcast frequencies.



Top view of chassis

CALIBRATION—Precisely calibrated on all wave bands with a micrometer scale above main dial so that each band may be set at exactly the same point. This feature also enables the operator to accurately log the main dial.

BAND SPREAD—Both mechanical and electrical band spread are used.

I. F. SELECTIVITY—Variable, providing varying degrees of Selectivity from 3 Kc. to 16 Kc. for 6 db attenuation.

CRYSTAL SELECTIVITY—Variable, high grade plug-in crystal unit, providing 6 degrees of extremely sharp Selectivity.

BEAT FREQUENCY OSCILLATOR — With variable pitch control for the reception of CW signals.

AUTOMATIC VOLUME CONTROL — With On and Off switch to cut out Automatic Volume Control when required for the reception of code signals.

ANTENNA COMPENSATOR—Provides maximum signal strength on ultra high and shortwave stations.

SENSITIVITY CONTROL — Variable, allows Sensitivity to be adjusted for maximum signal to noise ratio on all bands.

NOISE SILENCER—Dickert System.

STATIC SUPPRESSOR—Special circuit to reduce or eliminate certain types of high frequency static and noise.

SIGNAL STRENGTH INDICATOR — Meter calibrated both in db's and r's. The indicator pointer may be set on each wave band to cancel out noise, giving accurate indication of signal strength on any station received.

SEND-RECEIVE—Switch is provided connected to relay so that receiver may be instantly switched with push button control on receiver panel from receiving to sending position. If transmitter is used in connection with the receiver, relay can be wired to transmitter Off and On switch.

DIAL MECHANISM—Special Dial Mechanism with fly wheel spinner providing fast tuning speed with beautifully smooth tuning control. Back lash completely eliminated.

BASS AND TREBLE CONTROLS—Continuously variable to provide finest possible tone on all signals or programs received.

HEADPHONE JACK—Yes.

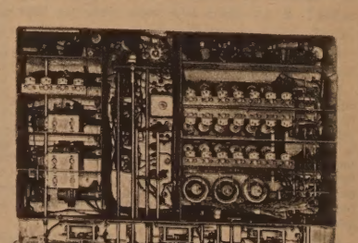
POWER OUTPUT—25 to 40 watts.

SPEAKER—Special 12" High Fidelity.

PRICE—$650.00 FOB Chicago.

DELIVERY—Four to six weeks after receipt of order.

TECHNICAL DESCRIPTION—Manual with circuit diagram, complete set of curves, and engineering specifications available for 50c.



Underneath view of chassis

COLLECTIBLES The HORN SPEAKER..... 9820 Silver Meadow Drive, Dallas, Texas 75217

points in air, was used a few years ago for microphone purposes by Dr. Philips Thomas of the Westinghouse Electric and Manufacturing Company and proved to be the only microphone, which I know of, capable of responding to sounds well above 10,000 cycles per second in frequency. The device proved to be too unstable for the majority of practical uses, but it embodied a near approach to the idea of a vibrating unit, like a stream of electrons, which would have no inertia.

But even if nothing better appears than the present and promised forms of dynamic microphones there is every assurance that radio's electric ear will keep pace with the rest of the radio engineer's equipment, to say nothing of the directional characteristics of the new reflector and ribbon instruments.

RADIO NEWS FOR JANUARY, 1932

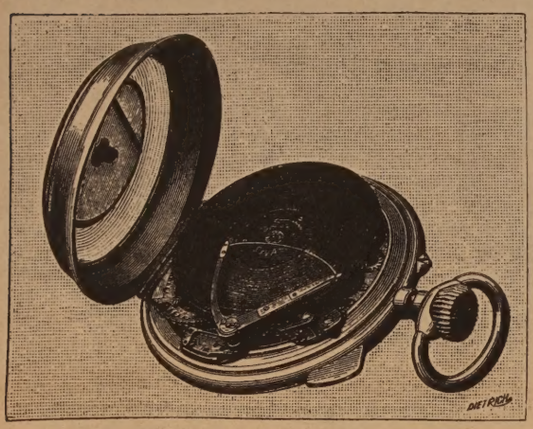


Fig. 1.—SPEAKING WATCH, WITH ITS PHONOGRAPHIC DISK.

Questions and Answers

J. B. A., Courtland, Kansas.—1. Is Cal Stewart the same person as Andrew Keefe? 2. Who sings in the Edison Mixed Quartette?

[1. Cal Stewart and Andrew Keefe are two individuals. 2. Because of more or less frequent changes in the personnel of the Edison Mixed Quartette, we do not publish the names.]

J. S. R., Ellenburg, Wash.—1. Some one informed me that Ada Jones is dead. Is she? 2. Do Gold Moulded Records harden with age? 3. How long should a copper diaphragm last? 4. Does furniture in the room have any effect on Record making?

[1. Miss Jones is still living. 2. We do not think so. 3. We cannot say how long a copper diaphragm should last. With proper care we do not see why its life should not be several years. 4. The rooms in which we make Records are almost entirely devoid of furniture. For making vocal or solo Records, however, where the speaker or singer talks right into the horn, the furniture in the room does not affect the Record.]

Mrs. D. C. M., Everett, Mass.—1. How should about 250 Records be packed to go on a journey of 6,000 miles? 2. Are there any cases made for that purpose? 3. There are five changes to be made on the trip, so would it be safe to express them? 4. Do you have felt cases made to sell for the large horns?

[1. If we were shipping them we would first put them in paste-board packing, similar in construction to the brown board used for packing eggs, and then we would put them in a strongly built wood case. 2. We could furnish the foregoing but it would cost more to get it than it is worth. Try packing them in a good sized box, protecting the Record boxes with an ample supply of excelsior. 3. Yes, if properly packed. 4. No, but perhaps your local Dealer can get one for you.]

H. I. S., Grand Ledge, Mich.—What is the material used in the recorder weight that holds the diaphragm in its place? Is it paraffine wax?

[It is a special composition called stratena.]

N. L. T., Seattle, Wash.—1. Are "Cyrus Pippins" and Byron G. Harlan identical? 2. Is Record No. 9779 made with the assistance of Byron G. Harlan?

[1. Yes. 2. Yes.]

THE NEW PHONOGRAM, May 1909

SPEAKING WATCHES.

To get up anything new in the way of watches seems difficult. The precision of the present construction leaves little margin to progress, and the indications that it has been possible to give these small instruments are so numerous and interfere so little with the perfect running of them that we might consider perfection as having been nearly reached in watchmaking.

Mr. Sivan, a French watchmaker, established at Geneva, has, nevertheless, succeeded in stepping outside of the beaten track in devising a chronometer that speaks the hours, instead of striking them, through an ingenious application of the phonograph.

The ordinary repeating watch carries a detent through which it is possible to free a small movement that actuates little hammers which strike spring bells. It is thus possible to strike the hours, quarters and even the minutes at will. This bell device, which is essentially monotonous, requires, moreover, close attention on the part of the owner of the watch, who is obliged to count the strokes and to distinguish the intervals between the hours, quarters and minutes. There are no such inconveniences in the Sivan watch. The spring bells are replaced by a vulcanized rubber disk provided with grooves upon which the hammers bear, through a point. The accompanying figures will permit of the operation being understood.

Fig. 1 represents the watch open, with its phonographic disk, which is provided with 48 grooves that correspond to the 12 hours and to the 36 quarters traversed by the hand in making one revolution of the dial. Fig. 2 shows the same watch, from which the disk has been removed in order to allow the mechanism to be seen. This disk is seen on the side opposite that carrying the grooves.

When the detent is pressed, the rubber disk begins to revolve, the point that follows its sinuosities vibrates, and the vibrations are manifested by such expressions as "It is eight o'clock," "It is half-past twelve," etc. The grooves, in fact, are the exact reproduction, upon a plane, of the helicoidal groove produced by a human voice upon a phonograph cylinder.

Naturally, watches are not the sole pieces of wheelwork to which this ingenious system is applicable. All clocks may be provided with it, and, for the moment, Mr. Sivan is already constructing alarm clocks which, instead of the strident and ear-piercing bell that every one is acquainted with, have speaking disks. One can thus have himself awakened by the crowing of the cock, or by the vigorous accents of a well known voice. The inventor is constructing some alarms which, with a disk of 6 or 7 centimeters, cry out to you from one room to another, through closed doors, such phrases as "Get up!" "Come, wake up!" loudly enough and long enough to snatch you from the arms of Morpheus.

In addition to the difficulty resulting from the disproportion between the smallness of the grooves and the force that is necessary to give the sound, Mr. Sivan has had several others to surmount. It was necessary, in the first place, to introduce the system into a watch case without exaggerating the latter's dimensions, and afterward to find a plastic, although resistant, material for the disks. These obstacles have been happily surmounted. Mr. Sivan's watches resemble the ordinary repeaters; and their disks, despite the pressure of the point, are capable of speaking several thousand times without showing any appreciable wear.

Further, by retouching the phonographic grooves, suppressing some of them, and exaggerating others, the inventor has succeeded in giving the words pronounced the peculiar accent characteristic of such or such a locality. Amateurs who may not be content with ordinary disks will thus be able to order others that will be true family souvenirs. There is no limit to the variety of the combinations of which the realization becomes possible with this system.

There is one thing, however, that it will be necessary to see to, and that is, that in houses that possess several speaking watches or clocks, the latter shall run in perfect unison. Otherwise their disputes, sources of pernicious examples, might chance to disturb the tranquillity of serious households and cause steady people to lose their reckoning. But the precision of the apparatus easily permits of avoiding such an inconvenience.—La Nature.

SCIENTIFIC AMERICAN, Sept. 29, 1894

THE NEW PHONOGRAM

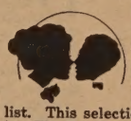
FOR MAY, 1909

MISS MABEL McKINLEY
Soprano

122 Golden Rod — **Mabel McKinley**

Miss McKinley is one of the most notable additions ever made to the staff of Edison artists. She is a niece of the late President McKinley, a composer of great merit, the possessor of a delightfully sweet soprano voice, a woman of charming personality and a universal favorite on the stage. "Golden Rod" is one of her own compositions. It is dedicated to Vice-President Fairbanks. Miss McKinley also wrote "Anona" and other musical successes. "Golden Rod" is a song of the national flower. Its words are patriotic, its musical setting is perfect and Miss McKinley's singing of it is artistic in every sense of the word. Orchestra accompaniment.

10134 Shine On, Harvest Moon — **Ada Jones & Billy Murray**



Scarcely less popular than Miss Jones' solo Records are those made with the assistance of Mr. Murray, himself one of the best of the Edison artists. The duet Records by Miss Jones and Mr. Murray are eagerly sought for in each month's list. This selection is a serio-comic song, featured in "The Follies of 1908." The dialogue between the chorus is alone worth the cost of the Record. Orchestra accompaniment. Music, Nora Bayes-Norworth; words, Jack Norworth.

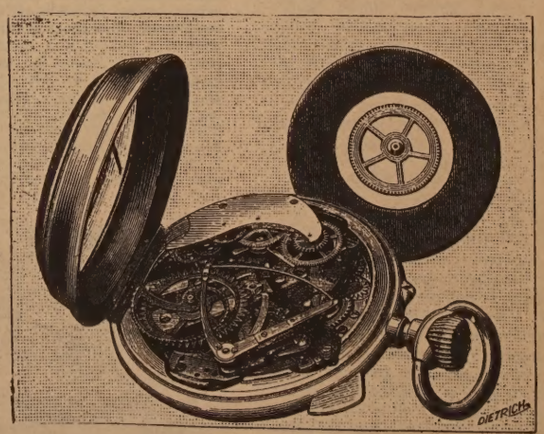
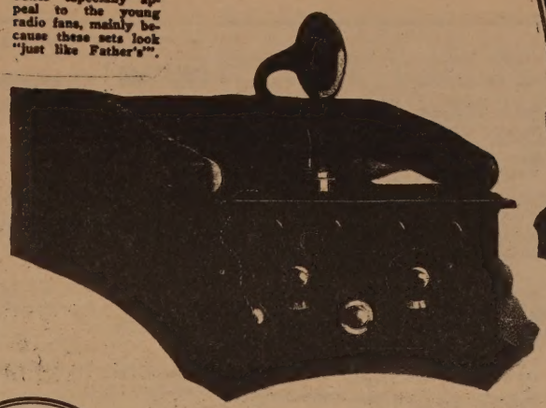
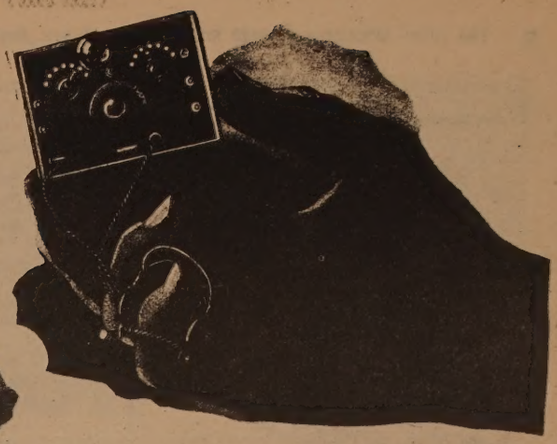


Fig. 2.—SPEAKING WATCH, WITH THE DISK REMOVED, IN ORDER TO SHOW THE INTERNAL MECHANISM.

MEET RADIO ROSE. Miss Louise Henry, an inventor of New York, designed Radio Rose. The doll has a complete three tube receiver built in it and there is a loud speaker cleverly concealed in the chest. Radio Rose will receive music from any station within a liberal radius and sings or lectures while she is taken for a walk
© Underwood & Underwood

RADIO CANDY BOXES. Below: These two candy boxes especially appeal to the young radio fans, mainly because these sets look "just like Father's".





RADIO CLOCK THAT CALLS YOU AT ANY TIME. Instead of the old-time alarm clock, the sleepy radio fan may be awakened at a certain time by this new combination of clock and radio receiver. Photo courtesy Pinto Speaking Clock Co., Inc.

1925 ad

The "LINCOLN"
Enclosed Fixed Adjustable Detector
Kills your Reflex Troubles
New ListPrice $1.50
Manufactured by
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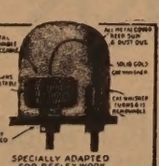
Los Angeles, Cal.



Burns
PERFECT REPRODUCER
Tone loud and pleasing. Handsome material and design.
Black—$22.50 Shell—$25.00
AMERICAN ELECTRIC CO.
State and 64th Sts. Chicago

1925 ad

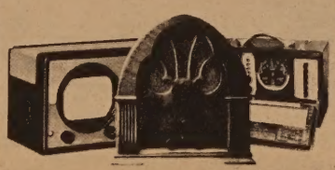
Latest Addition to Our Series

Morgan E. McMahon's

A FLICK OF THE SWITCH

your new 1930-1950 adventure.

Your Ticket From Static to Snow



A FLICK OF THE SWITCH is coming! Customer friends have been asking for an enjoyable and authoritative book on radio of the 1930's and 1940's. This book will be great reading, and its 1,000-plus pictures will make it the 1930-1950 standard reference for collectors and historians. It is well worth your time and money if you're interested in any of these:

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- Broadcast history.
- Early radio-TV programs.
- Ham radio.
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Re-live those early days in

A FLICK OF THE SWITCH

—our new 1930-1950 book

Here's your time trip to the great days of radio broadcasting and the dawn of television. Revisit the Lone Ranger, Atwater-Kent radios, Will Rogers, Scott All-Wave, old "Ham" days and many more.

You'll read about the people and programs that swept us into a new era. You'll get a chuckle out of old-time radio ads. See over 1,000 sets that will become collector's items, and discover the rewards of collecting as a hobby.

You'll have a great time reading and re-reading this book. When you're through, put it on your shelf as the new standard collector's reference on 1930-1950 radio and television. High quality, 260 pages, $9.95 deluxe hard-cover or $6.95 handbook.

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RADIO COLLECTOR'S GUIDE is the collector's data book, with 50,000 facts, 1921-1932, 264 pages, $4.95 handbook.

1927 RADIO ENCYCLOPEDIA is your technical book on wireless and early radio. High quality reproduction of the original. 175 pages. $12.95 deluxe hard-cover. $9.95 handbook.

MOST-OFTEN-NEEDED 1926 - 1938 RADIO DIAGRAMS covers 600 popular early radio models. 240 pages, $7.00. ALSO: circuit diagram for any pre-1951 radio $3.50.

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FREE AGE GUIDE with each order. This is a handy wallet-sized card with hints on how to tell the true age of a radio from patent numbers, tube types, style, etc. Keeps you from being skinned by sharpies.

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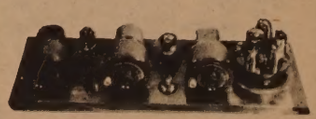
MOST - OFTEN - NEEDED RADIO DIAGRAMS books from our previous offer are running low. We've reprinted the 1926-1938 volume, so there are plenty available at $7.00. 1941, 42, 46, 48 and 50 are still available at $4.00 each. all six volumes $25.50.



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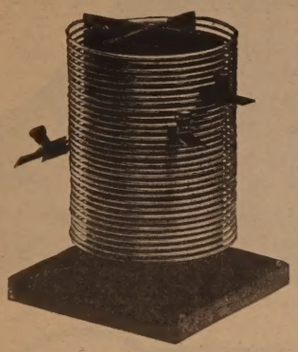
TROUBLE-SHOOTING CHART

POSSIBLE SOURCE OF TROUBLE	SYMPTOMS OF TROUBLE					
	NO RECEPTION	VOLUME WEAK	IRREGULAR RECEPTION	DISTORTION	NOISY RECEPTION	HUMS AND WHISTLES
"A" BATTERY	Battery exhausted. No water in storage battery. Battery terminals corroded.	Battery exhausted. Poor connection at corroded terminals. Charger not equal to demand on battery Trickle charger not functioning.	Loose connection.	Battery exhausted.	Battery sulphated. Connected charger operating.	Hum from charger operating. Whistles from depleted battery.
"B" BATTERY	Battery exhausted. Battery not properly connected.	Battery exhausted. Volume starts off well but quickly diminishes while set is played.	Defective cell. Loose connection.	Battery exhausted.	Erratic noises — battery exhausted. Fluttering, motorboating — high resistance of run-down battery.	Whistles from run-down battery.
POWER PACK	Not connected to power socket. Rectifier tube not operating. Filter coils burned out. Resistor burned out. Fuses in power supply burned out. Plate of rectifier tube red hot—condenser broken down or short circuit in filter. Electric light line power off—or fuse blown.	Eliminator overloaded. Rectifier tube worn out. Transformer short circuited. Buffer condensers punctured. Filter condensers punctured. Improper resistor values in voltage divider. Electric light line voltage too low.	Interrupted current supply from power lines. Poor voltage regulation of power line.	Plate voltage too low. C bias resistors not properly adjusted. Too high resistance in choke coils. Insufficient capacity of filter condensers.	Defective resistor in voltage divider. Sparking—over punctured condenser. Motorboating—insufficient capacity of last filter condenser. Improper value of resistors in voltage divider. Rectifier tube wearing out.	Transformer not balanced on center tap return. Eliminator overloaded. Insufficient inductance in chokes; cores too small; ohmic resistance too high. Insufficient capacity in condenser bank. Choke coil short circuited, or not functioning. No grounded shield between primary and secondary of power transformer. Eliminator not adequately shielded. Coupling between A.F. amplifier stages and eliminator, placed too close to set.
ANTENNA AND GROUND	Antenna grounded. Antenna disconnected. Ground connection open. Defective lightning arrestor.	Antenna disconnected. Antenna poorly insulated, grounded or wire corroded. Antenna too short. Antenna too long; insert midget condenser. Coupling between antenna coil and secondary too loose. Loose or corroded ground connection.	Swinging antenna becoming grounded at times. Loose or corroded ground connection.	Parallels, or too close to antenna of nearby oscillating receiver.	Antenna too close, or parallel, to power lines. Antenna too long—picks up too much stray noise. Loose or corroded ground connection. Antenna runs too near interfering electrical devices.	A.C. hum or commutator ripple picked up from nearby power lines. Negative side of filter circuit not grounded. (B—).
TUBES	Tube burned out. Tube paralyzed. Tube prongs not making contact.	Tubes exhausted. Wrong type of tube used. Power detector not warmed up. Too much grid bias. Corroded tube contacts.	Imperfect prong contacts. Detector tube paralyzed. Improper value of grid leak.	Tubes worn out. Tubes getting insufficient current. Improper "C" bias on grids. Detector tube overloaded. Wrong type of tube in last stage.	Microphonic tubes; require cushioned sockets. Gaseous rectifier tube aging. Hissing, due to power detector tube starting characteristic, or worn-out tube.	Tube deteriorating. Too high voltage on detector tube. Wrong type of A.C. tube in detector stage. No center tap in detector tube's filament circuit.
CIRCUIT	Switch open. Open circuit in set. Burned-out A.F. transformer winding.	Insufficient regeneration (S. W. set). Antenna too long (S. W. set). Grid leak improper value. Imperfect contacts. Defective piece of apparatus. Neutralization system out of adjustment. Insufficient plate voltage. Burnt out A.F. transformer winding.	Loose connection somewhere in set, eliminator, power supply or speaker connection. Sharply moving wires or set while in operation will accentuate trouble.	Over-regeneration. Nearby oscillator. Poorly designed transformers. Coupling condensers too small. Circuit too sharply tuned. Last stage inadequate. No biasing on tubes.	Squeals, bloops — set not neutralized. Neutralizing condensers not properly adjusted. Defective grid leak. Motorboating — lower the value of resistors in resistance coupled amplifiers. Broken wire or imperfect contacts. Burnt out audio transformer.	Oscillation from over-regeneration. Set not properly neutralized. Magnetic feed back between stages. Open grid circuit. Center tap of transformer not balanced. Grid return to center point of potentiometer across A.C. tubes not properly adjusted.
SPEAKER	Speaker disconnected. Open circuit in speaker unit, jack, plug or cord. Speaker short circuited. Coil in speaker unit burned out.	Speaker out of adjustment. Loose contact. Leak across speaker cord. Choke coil in output circuit has too high resistance or insufficient impedance.	Defective cord, jack or plug.	Speaker overloaded; eliminate direct coupling by using output transformer or choke condenser coupling. Not matched to tube in last stage. Poorly designed speaker.	Sound vibrations communicated from speaker to tubes in set. Electrical feed back from speaker cord to amplifying circuits.	Buzz or rattle in dynamic speaker due to moving coil rubbing against pole pieces. Hum due to worn-out rectifier. Feedback from speaker circuit to amplifying stages due to sound vibrations communicated from speaker to tubes in set.
GENERAL	Incorrectly wired set. Shielded location or dead spot. "SOS" on air. Set not turned on. Breakdown at broadcasting station—try another station.	Set inadequate. Spot poor for reception. Fading.	Breakdown in broadcasting—try another station.	Improper tuning. Fading. Weather condition. Unsatisfactory transmission from station—try another station.	Static; try disconnecting aerial and ground. Eliminator too close to set. Near-by regenerative set. Sparking electrical machinery.	Two stations on nearly same wavelength cause heterodyne whistle. Interference from near-by oscillator. Near-by regenerative or oscillating receiver.

Information from page 291 of S. Gernsback's RADIO ENCYCLOPEDIA, second edition 1931.

Radio Service Apparatus



A real efficient inductance, wound on a slotted Formica form, 4½" diameter of 31 turns of Number 10 hard drawn copper wire. Supplied with 3 special clips making adjustments variable to any fraction of a turn. Suitable for panel or bench mountings. Materials and workmanship the finest obtainable.

Type 850 Inductance, price.....$8.50

Part of 1921 ad

Alfred Graham & Co., London, England, Patentees

AMPLION

The World's Standard Loud Speaker

LEADS IN SALES THE WORLD OVER. HEAR IT!

THIRTY years have perfected and made The Amplion the finest loud speaker. This is to urge you to hear it—in comparison. Not only is The Amplion the *most sensitive* of loud speakers. In its reproduction of speech as well as vocal and instrumental music, it is also unrivaled for clarity and natural tone. Literature and dealer's name on request.

Phonograph Units in two sizes

THE AMPLION CORPORATION OF AMERICA

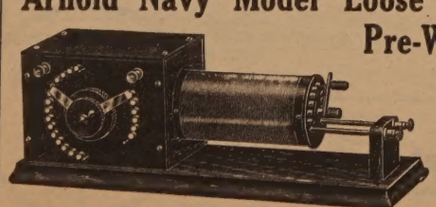
Executive Offices: Suite W 280 Madison Avenue, New York

1925 ad

1975 ad

1921 ad

Arnold Navy Model Loose Coupler Back to Pre-War Price, $15.00



The most consistent piece of Radio Apparatus to hear the Wireless Telephone on without distortion.

Range from 200 to 3000 Meters.

AMATEURS, COMMERCIAL AND ARLINGTON

use this Loose Coupler and the Arnold Audion Detector which sells complete with Batteries and Bulbs for $20 if you want results. But you must buy from the manufacturers to get these prices.

Order today. Prompt shipment promised or send 3c stamp for Catalogue.

J. F. ARNOLD, 2082 Lexington Ave., NEW YORK

ESTABLISHED 1910

SILVER GHOSTS

BY JWF PUETT

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OF EVERY KNOWN RECEIVER MANUFACTURED BY

THE EH SCOTT RADIO LABORATORIES

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PUETT ELECTRONICS

3008 ABSTON DR. MESQUITE, TEXAS 75149

Classic

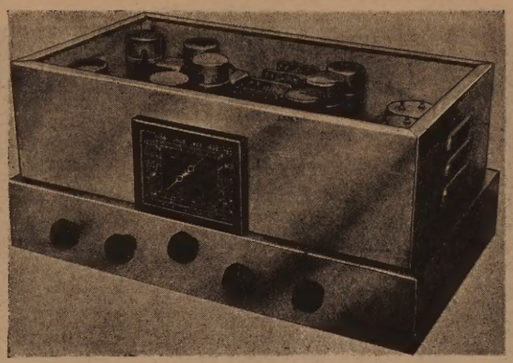
"DOUBLE-SUPERHET."

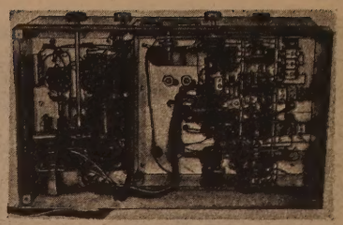
By heterodyning the signal first to 1,600 kc., and then to 125 kc.,

All-Wave Receiver

1934

The MATTHEWS' *Challenger!*

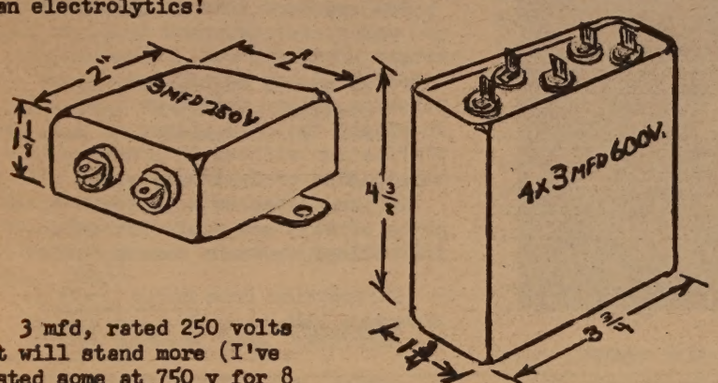




Bottom view of receiver chassis.

See next page for text and schematic.

Quality paper capacitors for replacements in AC radios and B-eliminators. Cheaper than new Mylars; even cheaper than electrolytics!



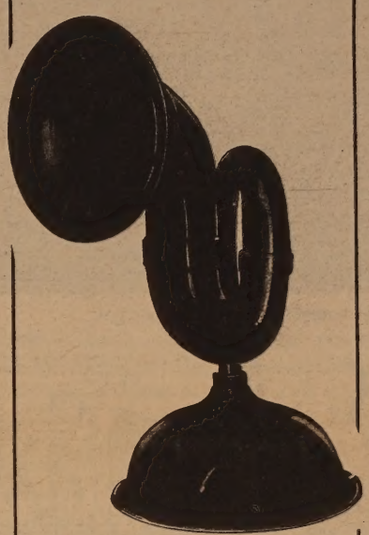
3 mfd, rated 250 volts but will stand more (I've tested some at 750 v for 8 hours with no failures, and one at 1500v). Will replace any capacitor up to 4 mfd in early AC power packs or B-eliminators. Oil-filled.

4 sections, each 3 mfd 600 volts. One of these will take care of an entire power pack. Boxed w/mtg brackets.

75¢ 10/$6.50 50/$25 $3. each 2 lbs.
Add postage: 4#/10, 20#/50
Mark this ad -- it won't be repeated for at least 6 months.
New boxed tubes: 2A7 & 71A $3. Used old-style; 81 $4, 74 $2
Lacquer-Stiks $1. Alan Douglas, Box 225, Pocasset MA 02559.

ARKAY

Loud Speaker



Radio News for January, 1922

Sound Amplifier

In an endeavor to produce a low priced loud talker, a manufacturer of radio apparatus has designed the sound amplifier shown in the photograph. The advantage of this type of sound amplifier is that any make of telephone receiver may be used in connection with it. The telephone receiver is merely mounted in the base with a screw applying it against a rubber ring, preventing any loss of sound. The screws are furnished with this instrument so that flat receivers may be used as well as amplifying types, which, of course, give best results. A notch in the base is provided for the cord of the phone, which may be simply taken out of a head set and replaced when desired.

To This Horn May be Attached Any Type of Telephone Receiver. It Gives a Great Sound Amplification When a Good Phone is Used in Conjunction With it and With an Amplifier Makes Signals That Are Readable Over a Large Area.

The complete instrument is made of brass and is either coated with black enamel, or nickel plated. Its shape gives to this sound amplifier very good amplifying properties and compared with another well-known apparatus, has proved to be equally efficient when a Baldwin receiver was inserted in the base. Of course, an amplifier is needed in connection with the receiving set in order to have a sufficient volume of sound produced by the telephone receiver, but for strong signals the instrument may be used with a detector tube only.

Sold for $5.00 in 1922 by Riley-Klotz Mfg. Co.

VICTOR

Edison Phonograph

Price **$60.00** Catalogue No. **A 3000** Code Word **Victor**

Size: { *Height, 11⅛ inches* / *Base, 20¾ by 10* } Net Wt. 48 lbs. Gross 100

Is equipped with electric motor (wound for battery) and governor; fitted with instantaneous speaker clamps, for instant interchange of speakers. It sets in an oak body box and is finished in black and gilt enamel. The mandrel is nickel plated and polished.

A battery is not a part of the Phonograph, but is an independent apparatus. Storage or primary (chemical) battery may be used, see pages 32 and 33. The motor requires a steady current of 2½ volts and 2 amperes. Its uniform action and continuous power supply recommend the **Victor** Phonograph for all occasions where these requisites are desired.

VICTOR

Edison Phonograph

(CONCLUDED)

Every **Victor** Phonograph includes, free of charge, an Edison Automatic Reproducer, an Edison Recorder, a sapphire shaving knife, a 14-inch polished brass horn, a two-way hearing tube, an oil can and camel's hair chip brush. The only change we make in the above equipment is to substitute a speaking tube for the 14-inch polished brass horn, if so desired.

CONQUEROR

Edison Phonograph

Price **$75.00** Catalogue No. **A 3001**

Code Word **Conqueror**

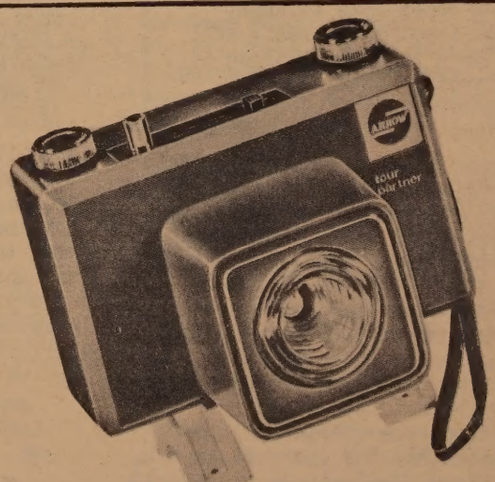
Size: { *Height, 11⅛ inches* / *Base, 20¾ by 10 in.* } Net weight, 48 lbs. Gross weight, 100 lbs.

In general appearance and equipment this Phonograph is exactly the same as the **Victor** described on page 20, (*without Storage Batteries*). Is furnished with an electric motor wound to run on the 110-120 volt direct current.

The most convenient style of Phonograph made.

The power is both continuous and handy, as connecting wires need only be attached to the nearest electric light connection. Equipped with resistance block fitted with lamps and cord, attaching plug of any make required, to fit customer's lamp socket.

From Edison catalogue for 1901.



MULTI-PURPOSE Bike Radio, consists of a solid-state AM radio, headlight and signal horn. Fits on handlebar of bicycle and comes with 2 flashlight batteries, bracket, screws and instructions. Unique and useful for bike rides .....perfect for beach, camping, picnics, sporting events, etc. Easy locking device permits user to install or remove in seconds, yet makes theft difficulty. Shipping weight 8 pounds, shipping size 13 X 9 X 6 inches. Comes post paid. Send $19.95 to Coe Enterprises, Dept. 1026, Box 259, Coe Drive, Mesquite, Texas 75149.

EDISON PERFECTING THE PHONOGRAPH.

The MATTHEWS'

Talk about innovation and advanced design being the main interest of classic set collectors, then the Matthews Challenger will occupy a top shelf in a room full of classic radios. And it was developed for use in 1934.

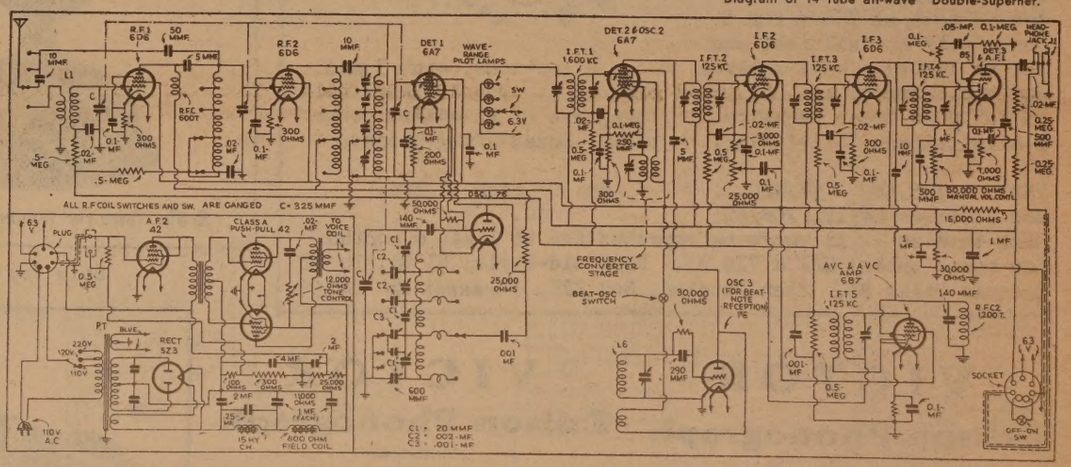
Every customer for the Matthews Challenger was given a questionaire to fill out so that A. C. Matthews could custom build the radio for a particular location. The tuner chassis was quadruple chromium plated and the customer's name was included on the dial along with any other words the owner might wish.

The receiver covered from 13 to 560 meters and extended to 10 to 2100 meters when required. Of course the novelty of the set is the incorporation of two different I.F. units in effort to use 3 stages of I.F. amplification without introducing tube noise, hiss or instability.

In the future we hope to have the price of this set, information about its builder, present owners, etc.

Information from Radio Craft for November 1934

Diagram of 14 tube all-wave "Double-Superhet."



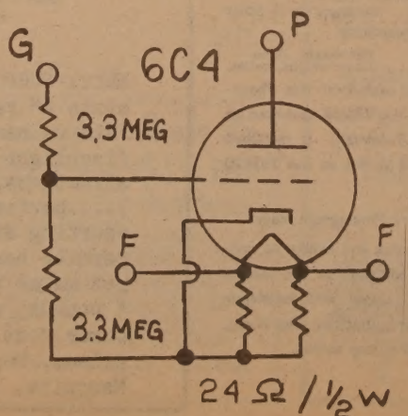
SHOP TALK

I recently tried again to come up with a visible substitute for 01A's that would require no set modification and work in most set tube positions with a minimum of incompatability. Enclosed is a schematic of a common active device with a few added passive devices. It draws 25MA filament current at 5 volts and has a MU of 8. I have directly plugged it into RF, audio output, and detector sockets in my Freshman Masterpiece. The device is known as a 6C4.

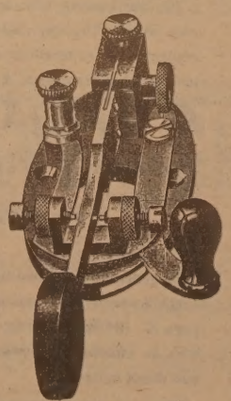
Seriously, though, there were a few problems in some of the RF applications; but I feel that a little alteration of the high resistance grid resistors would alleviate that. These alterations are probably necesitated by the fact that the 6C4 does not have a filamentary cathode. In an 01A or 40 the cathode is distributed along the filament; in my CKT the cathode is electrically at the center. The cathode resistors should not be made larger than specified in order to protect the antique tubes (if used) from drawing excessive filament current. 27 ohms should be considered maximum. Used at 5 volts the 6C4 should have very long filament life. Also, the CKT is small enough to be enclosed in an 01A or similar bulb, if one can get into it.

Mike Stosich
Bolling Brook, IL

The new column "Shop Talk" is designed to shorten the letter column and give space to readers who want to give others their ideas and experiences without writing a regular article. May we hear from you?



THE DOUBLE SPEED KEY.



This key requires but one-half the motions of the ordinary key, and these are made by a sidewise rocking motion of the hand, very easily acquired, which insures the operator not being affected with cramp. It is simple and inexpensive.

DESCRIPTION.

The Key Lever moves in a horizontal direction, standing normally between the two points, but not in contact with either. The knob should not be gripped, but allowed free play between thumb and finger. It is operated by an easily acquired sidewise rocking motion of the hand, and as contact is made in either direction, only about one-half the ordinary motions are required in forming signals. For instance, the word "Philadelphia" with the ordinary key requires 64 movements of the hand, 32 down and 32 up, whereas with the Double Speed Key, only 33 movements of the hand are necessary. Because of the horizontal motion being more natural and easy than the old method, and owing to the fewer movements required, this key is bound to become the leading telegraph key.

We sell these keys in two styles.

Style W has an adjustable spring tension for lever.
Style G has tension of lever fixed at best point.

These keys are now made only in legless or top connection form adapted to be fastened by wood screws to table or by machine screws to portable base.

Each key is provided with wood screws; each portable base is provided with machine screws.

No. 58X76.	Style W—Double Speed Key	$2.00
No. 58X78.	Style G—Double Speed Key	1.80
No. 58X79.	Portable Base only	.50
No. 58X80.	Wedge and Cord only	.80

From catalog No. 6 of The J. J. Duck Co., 1913

CLASSIFIED ADS

No. Words	One Issue	Two Issues	Three Issues	Twelve Issues
1-25	— 1.25	2.45	3.45	12.75
26-30	— 1.75	2.90	4.15	15.30
31-35	— 1.95	3.40	4.90	17.80
36-40	— 2.25	3.90	5.50	20.25
41-45	— 2.50	4.40	6.15	22.80
46-50	— 2.75	4.80	6.80	25.45
51-55	— 3.05	5.30	7.55	28.00
56-60	— 3.30	5.80	8.25	30.55
61-65	— 3.55	6.30	8.95	33.05

MISC.

PHONOGRAPH COLLECTORS, join the American Phonograph Society. Receive the quarterly Journal and four Newsletters. Receive free reprints and stereoscopic phonograph cards. For more information send 10¢ stamp. For one year membership, send $6.50. The American Phonograph Society, P.O. Box 5046, Berkeley CA 94705.

WILL DUPLICATE exactly, the mutilated panel for your antique radio. Send sketch or rubbing for quotation, or will trade for antique radios of equal value. Norman A. Parsons, 22 Forest St., Branford CT 06405.

WE BUY, SELL, REPAIR older radios. Tubes for nearly all radios and TVs ever made, old radio books and schematics $2.00. C. Church, Haddam, Conn. 06438.

FOR SALE OR TRADE

SPEAKER GRILLE CLOTH, fine, silky, 20's - 30's style fabric from an old warehouse. Nice, unobtrusive woven pattern (reversible) in muted gold and dark brown. Nothing like the heavy, coarse stuff they sell today. 24" wide, $4.00/yard. A yard will do about 6 Philco Baby Grands. Please add 25¢ for mailing. SASE for sample. Warren Dewey, 5021 Ambrose Ave., Los Angeles, CA 90027.

COLLECTORS: Binaural records (seperate tracks) used $4.00, new $6.00. Rekokut turntable, Rystensis motor 3/sp $37.00 cost $129.00. McIntosh 30W amp $55.00. Telegraph-keys, sounders, meters and old tubes. RCA Wireless Specialty Co. Faradon condenser Model 1803, 000025, $15.00. Al Dayes, Rt.1, Box 206, Whitewater CA 92282.

FOR SALE: Wireless Specialty Earphones...excellent condition..$50.00. Also available, other early phones, telegraph tape register, relays, switches & sounders.
Amrad Spark Coil.....$125.00.
R. Matson, 388 Concord Rd., Bedford, Mass. 01730, 617-663-3877.

FOR SALE: Emerson radio, 1930's model DS365, mint condition; 12" speaker, excellent tone; 17 X 11 X 11 cabinet by Ingraham, Briston, Conn. Best offer. La Placa, 53-49 97 St., Queens, N.Y. 11368.

NEW, Robert Gelatt's book about the history of the phonograph, The Fabulous Phonograph, out of print price $9.95, damaged $5.00. THE HORN SPEAKER, Box 12, Kleberg TX 75145.

FOR SALE OR TRADE

FOR SALE: Operadio portable 6-tubes battery, front 12-3/4 X 17-1/2 X 9-1/2" original good condition $75.00. Sue Covey, 316 Panhandle, Denton TX 76201. Pho: 817 387-4473 after 5.

FOR SALE OR TRADE, BY LOT OR PIECE: Weston #692 Oscilator, plug in coils, all bands; Weston #772 Supersenative Awalysen, accessories, manual; NRI RC testor #111; Feiler electronic Stethoscope #TS-3. Need: Crosely # #124 chasis and speaker. Dick Schamberger, 1975 Hertel Ave., Buffalo, N. Y. 14214.

CLOTH COVERED POWER CORD, new 2-conductor cord as used on AC sets of the twenties, thirties, forties. From old stock, limited quantity. In brown or gold, 25¢/foot. Please add 50¢ for mailing. Warren Dewey, 5021 Ambrose Ave., Los Angeles CA 90027.

HORN PHONOGRAPHS, grind organs, etc, etc. Bought & sold. Send $2.00 refundable for large illustrated list. S. Leonard, P.O. Box 28, Little Neck, New York 11363.

WD11 Adaptors, use UX199, 120, VT24. No wiring changes, Radiola III's battery hook up included $5.25 pp., 2 for $9.25. Keith Parry, 17557 Horace St., Granada Hills CA 91344.

FOR TRADE: Loose Couplers. 1912 Clapp-Eastman, 1912 Marconi, Adams Morgan Navy Type 1915. Trade for wireless equipment equal value. Guy Martin, P. O. Box A, Azusa CA 91702.

FOR SALE: 34 issues of Modern Electrics and Electrical Experimenter. SASE for list. Robert C. Campbell, 2175 S.E. Pine, Hillsboro OR 97123.

FOR SALE: Collection of antique Radios. Send SASE for list. Paul Giganti, 2429 San Carlos Ave., San Carlos, Calif. 94070.

FOR SALE: Rubber stamp with your name and address plus AK Radio and speaker $3.00 pp. James Fred, P.O. 42, Rossville IN 46065.

Miscellaneous

DON'T DIE without a WILL!
Blank will form protects your family. Only $2.00 guaranteed. Order today! COE Enterprises, Box 259, 75 Coe Dr., Mesquite, Texas 75149.

WANTED

WANTED: Radio News magazines 1925 March, May, June, July, August, October and December.
Popular Radio magazine, 1926 December.
Electronic Digest magazines 1972 - January and February issue.
J. Albert Warren, Box 279, Church St., Waverly PA 18471.

WANTED: AK 33 parts, grid leak, power cable, small trimmer cap knob, AK service manual. Also Philco model 70 parts, 4 knobs, tuning dial, escutcheon plate. Lawrence R. Moser, 5925 W. Florida Ave., Lakewood, Colo. 80226.

WANTED: Magnetic pick-up for model 61 Wurlitzer table model Juke Box. Just the electronic parts or the whole arm, or parts machine with good pick-up arm. Ira Dueltgen, 4126 N.E. 105th, Portland, Oregon 97220. Phone, 503 254-4430.

HELP! Would Like MICHIGAN RADIO MRC-2, two tube regenitive in good shape, will pay very good price or trade. Thanks, Del Hambly, 8910 NW Lovejoy, Portland, Oregon 97229.

WANTED: Interstage transformer for AK47 single 26 to PP 71A in working condition. In can or to fit can 2-1/8 diameter by 3 inches long. G. E. Frater, Pennsylvania Ave., Paoli, PA 19301.

WANTED: Crystal sets, battery and electric radios and televisions Mfg. before 1935. Need all related items. Will buy one set or complete collection. Young, 11 Willow Court, Totowa, N. J. 07512.

WANTED: Riders Radio Perpetual trouble shooters manuals Vols. 17, 18, 24, 25, 26, 27, index. E. H. Scott & McMurdo Silver radios. State type, condition and price. J. E. Cunningham, 23W 675 Ardmore, Roselle, Ill. 60172.

WANTED: Speaker cone and Antenna for RCA Radiola 18. Please send information and asking price to John W. Helser, 38895 Dodge Park Road, Sterling Heights, Mich. 48077.

WANTED: Board for AK Breadboard model 10- 30" by 10". Ronald F. Hill, 386 Roosevelt Ave., Lyndhurst, N. J. 07071.

WANTED: AK speaker, part #181000 for an AK radio Mod. 85. E. A. Thompson, Rt. 8, Box 474, Florence, Alabama 35630.

WANTED: WATCH CASE TYPE VOLTMETERS, Watchcase style earphones. H. Moncure, 47-734-2 Hui Kelu St., Kaneohe, Hawaii 96744.

WANTED: Jewell panel meter 0-5 VDC to fit 2 9/16" hole. Will buy or trade Modern Electrics and Electrical Experimenter. Don Knotts, 3158 N. E. Azales, Hillsboro OR 97123.

TUBES & DIAGRAMS

LIST NO. 11

PUETT ELECTRONICS

3008 ABSTON DRIVE MESQUITE, TEXAS 75149

HOW TO ORDER:

(1) ALL CHECKS OR MONEY ORDERS MUST BE MADE PAYABLE TO J.W.F. PUETT.

(2) Please state whether new or used tubes are desired and whether a half-price used tube is desired when a new tube is out of stock. REFUNDS are mailed with your invoice for out-of-stock tubes, or when, by customer request, a used tube is substituted for an out-of-stock new tube.

(3) All orders are shipped parcel post - no C.O.D. INCLUDE 15% FOR POSTAGE AND HANDLING. INSURANCE RATES ARE 30¢ for orders under $50.00. TEXAS RESIDENTS ADD 5% STATE SALES TAX.

MINIMUM ORDER $3.00

ALL TUBES ARE THOROUGHLY TESTED on a mutual conductance tube checker before shipment. CUSTOMER SATISFACTION GUARANTEED -- If you are not satisfied with your order for any reason, tubes may be returned within ten days for refund or replacement with exception of tubes which are shorted or have open filaments. It will be assumed that returned tubes with open filaments or shorts were damaged in shipment. Shipping damage claims will be handled promptly through the post office on insured orders. Puett Electronics assumes no liability for orders which are not insured, and no liability beyond that which is covered by postal insurance.

IN TABLE 3, THE SYMBOL n INDICATES THAT A TUBE IS AVAILABLE NEW AND THE SYMBOL u INDICATES THAT THE TUBE IS AVAILABLE USED.

TABLE 1. OLD-STYLE GLASS ENVELOPE TUBES all are used, thoroughly tested.

RADIOTRON		CUNNINGHAM		SYLVANIA		TUNG SOL	
10	$5						
UY224	$4.	C324	$4.	ST551	$3.	24	$3.
UY227	$3.	C327	$3.				
37	$3.	CX332	$3.	KEN RAD		PHILCO	
56	$3.	56	$3.	UX245	$4.	24	$4.
UX245	$4.			56	$3.	27	$3.
71A	$5.	NATIONAL				36	$3.
866	$4.	UNION		MAJESTIC		37	$3.
		NU199	$3.	G2L	$4.	45	$4.
PERRYMAN		NY224	$4.	G27	$3.	46	$4.
R281	$5.	245	$4.	G27S	$4.		
PA224	$4.			G35S	$4.	UNKNOWN BRAND	
		SILVERTONE				24	$3.
SPEED		227	$3.	CROSLEY		D227	$3.
27	$3.	232	$3.	56	$3.	245	$3.

ACE 224 $4.

TABLE 2. SPECIALS

Cunningham CX350 used $5.
Western Electric 205D used $6.
Western Electric 212F used $15.
Arcturus 56 (blue glass) used $5.
Cardon C4H4 used $4.

MAJESTIC - New In Original Cartons:

G2S	$5.		
G4S	$4.	6G7	$3.
2A6	$3.	6D7	$3.
2B7	$3.	6E7	$3.
G27	$4.	45B1	$5.
G27S	$4.	GL6A1S	$5.
G31	$4.	06Z5	$4.
G35S	$4.		

NEW TUBES:
Radiotron:
UY227 $5.
Cunningham:
C327 $5.
CX371A $7.
CX345 $6.
C347 $5.
Eveready:
ER551 $4.

NOTE

IF YOU DO NOT SEE A TUBE WHICH YOU SEEK LISTED, SEND US A SELF-ADDRESSED STAMPED ENVELOPE. WE MAY BE ABLE TO RECOMMEND A SOURCE OF SUPPLY.

TABLE 3. OLDER TYPE-NUMBER TUBES - prices listed for new tubes used tubes are half new price

0	u	$4.	5Z3	nu	$2.	6X5	nu	$3.	14C5	n	$3.	55	n	$3.
1A3	n	$3.	5Z4	nu	$2.	7A4	nu	$3.	14C7	n	$3.	56	nu	$3.
1A4	nu	$3.	6A3	n	$3.	7A5	n	$3.	14F7	n	$3.	57	nu	$3.
1A5	u	$3.	6A4	nu	$4.	7A6	nu	$3.	14F8	n	$3.	58	u	$3.
1A6	n	$3.	6A5	n	$3.	7A7	nu	$3.	14H7	n	$3.	59	n	$3.
1A7	nu	$2.	6A6	nu	$3.	7A8	nu	$3.	14J7	nu	$3.	70A7	n	$3.
1B4	n	$2.	6A7	nu	$4.	7AF7	nu	$3.	14W7	n	$3.	70L7	nu	$3.
1B5	u	$3.	6A8	nu	$3.	7AG7	nu	$3.	14Y7	nu	$3.	75	nu	$3.
1C5	nu	$3.	6B4	nu	$4.	7AK7	u	$3.	14W7	n	$3.	76	nu	$3.
1C6	n	$3.	6B5	nu	$4.	7B4	nu	$3.	14X7	n	$3.	77	nu	$3.
1C7	u	$4.	6B6	nu	$4.	7B5	nu	$3.	15	u	$5.	78	nu	$3.
1D5	u	$4.	6B7	nu	$4.	7B6	nu	$3.	19	nu	$3.	79	nu	$3.
1D8	nu	$4.	6B8	nu	$3.	7B7	u	$3.	24A	nu	$3.	80	nu	$2.
1E5	u	$3.	6C5	nu	$2.	7B8	nu	$3.	25A6	n	$3.	81	u	$5.
1E7	n	$3.	6C6	nu	$3.	7C5	nu	$3.	25A7	nu	$3.	82	u	$3.
1F4	n	$3.	6C7	n	$3.	7C6	u	$3.	25B6	u	$3.	83V	n	$3.
1G4	nu	$3.	6C8	nu	$3.	7C7	nu	$3.	25C6	u	$3.	84	nu	$3.
1G5	u	$3.	6D6	nu	$3.	7C8	u	$3.	25L6	nu	$2.	85	nu	$3.
1G6	u	$2.	6D7	n	$3.	7E7	nu	$3.	25S	u	$3.	89	n	$3.
1H4	u	$3.	6E6	n	$3.	7F7	nu	$3.	25Z5	nu	$2.	117-		
1H5	nu	$3.	6E7	u	$3.	7F8	nu	$3.	25Z6	nu	$2.	L7	nu	$4.
1H6	nu	$2.	6F5	nu	$3.	7G7	u	$3.	26	nu	$4.	117-		
1L4A	n	$3.	6F6	nu	$3.	7H7	u	$3.	26A6	n	$3.	Z6	nu	$3.
1LA6	nu	$3.	6F7	nu	$5.	7J7	n	$3.	26A7	nu	$3.	9002	n	$3.
1LB4	nu	$3.	6F8	nu	$2.	7K7	u	$3.	27	nu	$3.	9003	n	$3.
1LC5	n	$3.	6G6	nu	$3.	7L7	nu	$3.	28D7	nu	$3.	VT52	u	$4.
1LC6	n	$4.	6H6	nu	$2.	7M7	nu	$3.	30	nu	$3.	XXB	n	$3.
1LD5	nu	$3.	6J5	nu	$3.	7Q7	nu	$3.	31	nu	$3.	XXFM	u	$3.
1LE3	n	$4.	6J7	nu	$3.	7S7	n	$3.	32	n	$3.	XXL	nu	$3.
1LF3	n	$4.	6J8	u	$3.	7S7	nu	$3.	32L6	u	$2.			
1LG5	n	$3.	6K5	nu	$3.	7V7	nu	$3.	32L7	n	$3.	ADDITION:		
1LH4	nu	$3.	6K6	nu	$3.	7X6	n	$3.	33	n	$3.			
1LN5	nu	$3.	6K7	nu	$3.	7Z7	u	$3.	34	nu	$3.	285	n	$4.
1N5	nu	$3.	6K8	nu	$3.	7Y4	nu	$3.	35	nu	$3.	605	n	$3.
1P5	nu	$3.	6L5	nu	$3.	7Z4	nu	$3.	35Y4	u	$2.	10/VT-		
1Q5	nu	$2.	6L6	nu	$3.	12A7	nu	$3.	35Z3	nu	$3.	25	n	$4.
1V	n	$4.	6L7	nu	$3.	12A8	u	$3.	36	u	$3.			
2A3	nu	$5.	6N5	n	$3.	12B7	u	$3.	37	nu	$3.	22	u	$5.
2A4	nu	$4.	6N6	nu	$3.	12B8	u	$3.	38	nu	$3.	6H4	u	$3.
2A5	u	$3.	6N7	nu	$3.	12C5	nu	$3.	39	nu	$3.	9004	n	$4.
2A6	nu	$3.	6P5	nu	$3.	12C8	nu	$3.	41	nu	$3.	83	nu	$5.
2B7	nu	$3.	6Q7	nu	$3.	12F5	n	$3.	42	nu	$3.	5U4	n	$3.
3G6	n	$3.	6R7	nu	$3.	12J5	nu	$3.	43	nu	$3.	1520	u	$3.
3LF4	n	$3.	6S7	nu	$3.	12J7	nu	$3.	44	nu	$3.			
3Q5	nu	$2.	6S8	n	$3.	12K7	nu	$3.	45	u	$4.			
5B4	u	$2.	6T7	u	$3.	12K8	nu	$3.	46	nu	$4.			
5Y4	nu	$2.	6T8	n	$2.	12Q7	nu	$3.	47	nu	$5.			
5U4	nu	$2.	6U6	nu	$3.	12Z3	u	$3.	48	n	$5.			
5V4	nu	$2.	6U7	nu	$4.	14A4	n	$3.	49	n	$4.			
5W4	nu	$2.	6V6	nu	$2.	14A7	u	$3.	50A5	nu	$2.			
5Z4	nu	$2.	6V7	nu	$3.	14B5	n	$3.	50C6	n	$2.			
5Y3	nu	$2.	6Y6	nu	$2.	14B6	nu	$3.	50X6	nu	$3.			
5Y4	nu	$2.	6Z4	nu	$2.	14B8	n	$3.	51	nu	$3.			

IN TABLE 4, THE SYMBOL n INDICATES THAT A TUBE IS AVAILABLE NEW AND THE SYMBOL u INDICATES THAT THE TUBE IS AVAILABLE USED.

TABLE 4. MORE RECENT TUBE TYPES - prices listed for new tubes used tubes are half new price

0A2	n	$2.	6AT6	nu	$2.	12A5	nu	$3.	35Z5	nu	$2.	1629	u	$3.
0A3	u	$2.	6AU6	nu	$2.	12A6	nu	$3.	35Z6	nu	$3.	1633	u	$2.
0B3	u	$2.	6AW6	nu	$2.	12AT6	nu	$2.	40Z5	u	$3.	1634	u	$2.
0C3	nu	$2.	6BA6	nu	$2.	12AT7	u	$2.	45Z3	n	$3.	1635	u	$2.
0D3	nu	$2.	6BE6	nu	$2.	12AU6	nu	$2.	4525	nu	$3.	2050	nu	$3.
0Y4	n	$3.	6BJ6	nu	$2.	12AU7	nu	$2.	50B5	nu	$2.	2051	nu	$3.
0Z4	nu	$3.	6C4	nu	$2.	12AV6	nu	$2.	50C5	nu	$2.	5686	n	$2.
1L4	nu	$4.	6J6	nu	$2.	12BA6	nu	$2.	50L6	nu	$2.	5691	n	$2.
1L6	n	$5.	6S4	n	$2.	12BE6	nu	$2.	50Y6	nu	$3.	GK-		
1R5	nu	$2.	6SA7	nu	$3.	12L6	nu	$3.	50Y7	nu	$3.	5703	u	$2.
1S4	n	$1.	6SB7	nu	$3.	12SA7	nu	$2.	117-			5749	u	$2.
1S5	nu	$2.	6SC7	nu	$2.	12SC7	n	$3.	Z3	nu	$3.	5751	nu	$2.
1T4	nu	$2.	6SD7	nu	$3.	12SF5	n	$2.	117-			5814	n	$2.
1T5	nu	$2.	6SF5	n	$2.	12SF7	n	$2.	Z4	u	$3.	5879	n	$2.
1U5	nu	$2.	6SF7	n	$2.	12SG7	nu	$3.	807	nu	$5.	5881	u	$4.
2C26	u	$3.	6SG7	nu	$3.	12SH7	n	$3.	879	n	$3.	5992	n	$2.
2X2	n	$3.	6SH7	nu	$2.	12SJ7	nu	$3.	884	n	$5.	6080	u	$4.
3A4	nu	$2.	6SJ7	nu	$3.	12SK7	nu	$3.	930	n	$3.	6842	n	$2.
3A5	nu	$2.	6SK7	nu	$2.	12SL7	nu	$3.	950	u	$4.	6973	n	$2.
3A8	n	$3.	6SL7	nu	$2.	12SM7	nu	$2.	955	n	$4.	7193	u	$2.
3Q4	nu	$2.	6SM7	nu	$1.	12SQ7	nu	$2.	958	u	$4.	VR90	nu	$2.
3B4	nu	$2.	6SQ7	nu	$2.	12SR7	nu	$3.	GK-			VR-		
3V4	nu	$2.	6SR7	nu	$2.	12Y6	nu	$3.	1005	u	$3.	105	n	$2.
6AB4	nu	$2.	6SS7	nu	$2.	12W6	n	$2.	KU15B	u	$3.	VR-		
6AB7	nu	$2.	6SU7	n	$2.	12X4	nu	$2.	1201	u	$3.	150	nu	$2.
6AC5	nu	$2.	6SV7	n	$2.	19T8	nu	$3.	1203	u	$3.	ADDITION:		
6AG7	nu	$3.	6W6	nu	$2.	35A5	nu	$3.	1232	u	$3.	1N5	n	$2.
6AK5	nu	$2.	6X4	nu	$2.	35C5	nu	$2.	1273	u	$3.	2E30	n	$3.
6AL5	nu	$2.	6X5	nu	$1.	35L6	nu	$2.	1612	u	$4.	6837	n	$2.
6AL7	n	$2.	6Y5	u	$2.	35W4	u	$2.	1625	u	$3.	35B5	n	$2.
6AQ5	nu	$2.	6Y7	u	$2.	3524	nu	$2.	1626	u	$3.			

TABLE 5. BALLAST TUBES $3.00 (new)

1E1, 33AG, 042, K36A, K55C, K55D, 62A, K80B, K90E, K92B, 100-37, 100-70, 100-77, 100-79, 160A, 165-14, 200R, 200R-4, 250R, 250R-4, 300R, 305-1A, 50A-2, M55HG, 6-1, 3H-7, 7H-11, 2B14, 214, CR260-1.5, CRM300-8, CAA.

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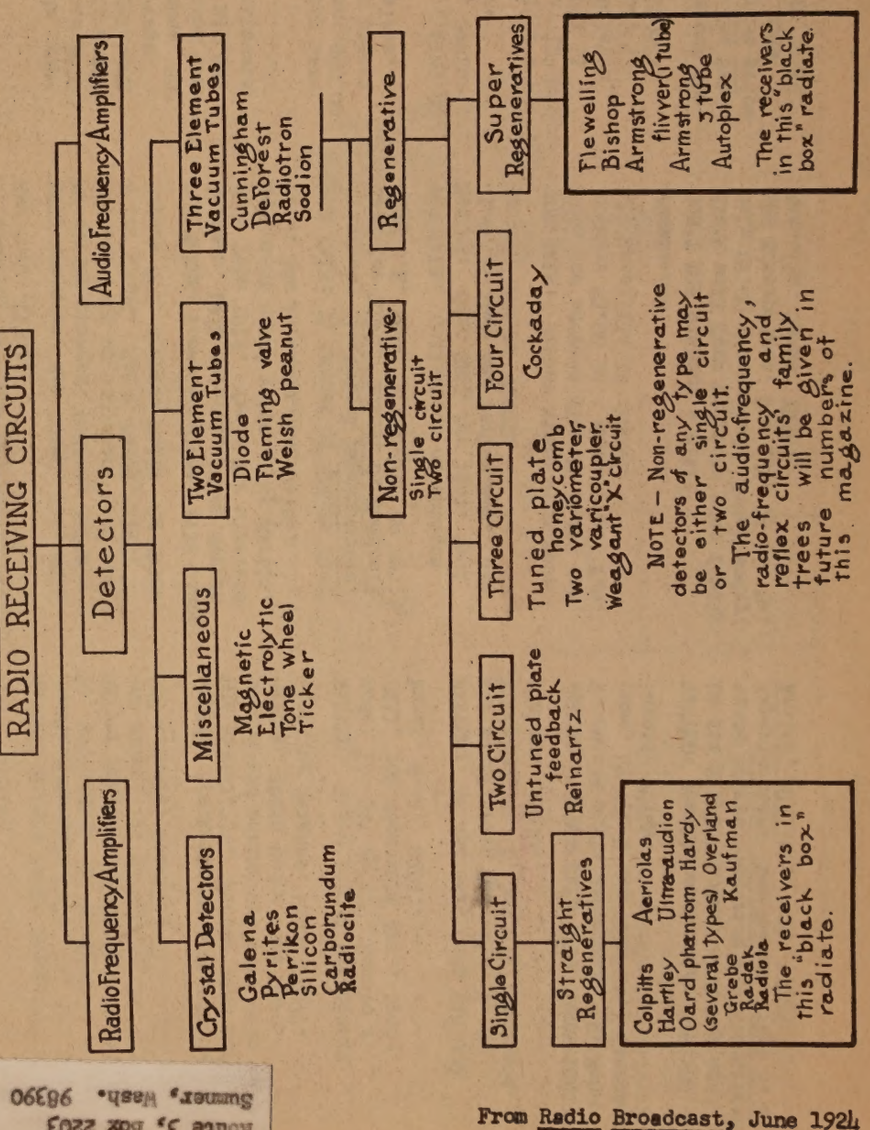

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